Oystra	**Crane Engineering Sales** **Mobile Septage Treatment System**	**SOP#**	**059**
		Revision#	002
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SOP Revised By	Mark Hassman	**Approval**	

Safe Operating Procedure: Clean and calibrate Turbidimeter sensor (AT040)

1. Purpose

The turbidity meter measures the cloudiness of the MF Permeate and is an indication of the liquid quality being sent to the RO unit. The measurement is used to alarm the system when an effluent quality event happens from the MF unit that could damage the RO unit.

The turbidimeter is calibrated using a standard solution to get accurate results. The calibration procedure should be performed (1) prior to system check-outs, (2) prior to operating in a new location after shipment, (3) every 20 operating days, and (4) in the event of questionable readings. The chamber cleaning and sensor cleaning procedure should be performed every time prior to calibration.

2. Scope

The calibration of the turbidity sensor is completed using the Rosemount 1056 Dual Channel Transmitter mounted on Oystra® skid. The sensor is removed from the machine and then reconnected to the transmitter for calibrating. After removing the sensor, it should be cleaned before calibrating.

There is (1) turbidity sensor on the Main Oystra® skid located on the MF permeate line. This SOP provides the cleaning and calibration method against a standard solution.

3. Safety

General

- The sensor needs to be removed for calibration to put the sensor in a calibration solution. The calibration requires control power to complete the calibration. A drain and lock out is required before removing the sensor.
- Ensure there is no pressure in the turbidity sample chamber by isolating the meter and opening the drain. Once drained, lock the inlet and outlet valves before removing the sensor.
- The calibration solution requires the proper PPE be worn while calibrating.
- In extreme cases of sensor fouling, a warm detergent solution or mild acid is used to clean the sensor.

PPE

- Wear chemical proof gloves and chemical safety goggles or a full-face shield when handling calibration solutions or acid during cleaning.

4. Cautions & Warnings

- Do not use abrasive cleaner on solvents to clean sensor.
- Used calibration solutions should be discarded after each use. Unused solution in the original bottle may be used in the future provided they are not past their expiration date and have been sealed.

5. Prerequisites

- Turbidity meter sampling chamber must be drained prior to removing the sensor.
- Lock out equipment available.
- Communicate to other team members your intent to calibrate
- 2 people are required – one to handle the buffer solutions and the other to manipulate the inputs at the transmitter.
- Black calibration cup specific to the turbidity sensor.
- Calibration solutions
    - Hach StablCal 20 NTU Turbidity Standard

6. Responsibilities

- This procedure can only be performed by individuals trained in meter maintenance activities

7. Procedure

Calibration:

1. After draining and lock out, unscrew the turbidity sensor from the sample chamber.
2. Clean the sensor per the procedure below.
3. Using distilled water clean the **container** being used for holding the calibration solution and **sensor**. Rinse the **container** and **sensor** with a small amount of buffer solution to remove any residual water that could dilute the calibration sensor. Once rinsed, pour approximately 3” of solution in the container.
4. Press the **Menu** button
5. Select **Calibrate**. Press ENTER
6. Select **Sensor 1**. Press ENTER.
7. Select **Turbidity**. Press ENTER.
8. Select **Standard** Press ENTER.

a. This method is for calibration with a standardized solution (20 NTU). The "Slope" method is also viable with filtered deionized water and a known turbidity solution made-up with the same deionized water. See manual in References.

9. When "Sensor in Standard?" appears on screen, immerse sensor in 20 NTU Standard Solution. Press ENTER.
10. If screen reads "Error", exit and repeat steps 1-7.
11. If screen reads "Cal Complete", calibration was successful.
12. See figure on following page for example flow chart

Checking the sensor for accuracy:

1. After draining and lock out, unscrew the turbidity sensor from the sample chamber.
2. Clean the sensor per the procedure below.
3. Using distilled water clean the **container** being used for holding the calibration solution and **sensor**. Rinse the **container** and **sensor** with a small amount of buffer solution to remove any residual water that could dilute the calibration sensor. Once rinsed, pour approximately 3" of solution in the container.
4. Check turbidity reading in a standard solution – typically 20NTU or 0.2NTU. If the difference between the sensor reading and the standard solution turbidity is +5 NTU then perform calibration as described above.

Cleaning the sensor:

1. Clean the sensor by rinsing it with water followed by wiping with a soft tissue.
2. If water is inadequate, wash with a mild detergent solution followed by thorough rinsing with water.
3. Do not scratch the lamp or photodiode windows.
4. If mineral scale is present, use a dilute acid solution applied with a cotton swab to clean away the deposit. Rinse thoroughly with water.

Cleaning the debubbler and measuring chamber:

5. Turn off the sample supply to the debubbler.
6. Remove the sensor and put it in a safe place. The calibration cup is a good place to store the sensor
7. Loosen the small drain plug in the base plug and allow the sample in the debubbler to drain out. Replace the drain plug.

8. Unscrew the upper and lower caps. Be careful not to lose the O-rings.
9. Use a stream of water, a brush, or a rag to flush and clean out the inside of the debubbler and measuring chamber
10. Inspect the O-rings for signs of damage and replace if necessary.
11. Replace the upper and lower caps
12. Replace the sensor

Cleaning the orifice

1. Turn off the sample to the debubbler.
2. Disconnect the drain line. Unscrew the drain fitting from the orifice; then unscrew the orifice from the debubbler body.
3. Use a stream of water to flush out any residue accumulated in the orifice. Direct the stream of water counter to the normal flow through the orifice.
4. If the material plugging the orifice cannot be removed with flushing, use a toothpick or a stiff wire to push out the obstruction. Push counter to the normal flow through the orifice.
5. Reinstall the orifice and reconnect the drain line. Turn on the sample flow.
6. If the blockage cannot be removed or the orifice is damaged during cleaning, replace the orifice.

8. References

- See OEM for Rosemount transmitter
  - Rosemount 1056 Dual Channel Transmitter manual
- Emerson T1056 Clarity ll Turbidimeter
  - https://www.emerson.com/documents/automation/manual-t1056-clarity-ii-turbidimeter-en-69024.pdf
- Turbidity standard
  - https://www.coleparmer.com/i/hach-26601-49-stablcal-20-ntu-turbidity-standard-500-ml/9951256

9. Pictures & Video Links

Figure 1 Turbidity sensor being removed from debubbler and measuring chamber

Figure 2 Dark Calibration Cup for sensor calibration

Figure 3 Location of transmitter for calibration adjustments

Figure 4 Sensor - do not scratch